

TITLE OF THE INVENTION

**BINDING DEVICE WITH FRONT UNFASTENING**

INVENTORS

**François GIRARD**

**Bruno LANCON**

**Jacques QUELLAIS**

## **BINDING DEVICE WITH FRONT UNFASTENING**

### **CROSS-REFERENCE TO RELATED APPLICATIONS**

**[0001]** This application is a continuation-in-part of patent application No. 10/054,913, filed on January 25, 2002, the disclosure of which is hereby incorporated by reference thereto in its entirety and the priority of which is claimed under 35 U.S.C. §120.

**[0002]** This application also claims priority under 35 U.S.C. §119 of French patent application No. 01.01603, filed on February 2, 2001, and French patent application No. 02.10185, filed on August 8, 2002, the disclosures of which are hereby incorporated by reference thereto in their entireties.

### **BACKGROUND OF THE INVENTION**

#### **1. Field of the Invention**

**[0003]** The invention relates to a device for binding a boot to a sports article.

**[0004]** More particularly, the invention can be applied to devices for binding a boot to a ski. It can be implemented particularly in the construction of bindings for cross-country skiing, alpine ski touring, mountain ski touring, and telemark skiing. It can also be implemented in the construction of bindings for ice skates, roller skates, and snowshoes.

#### **2. Description of Background and Relevant Information**

**[0005]** An example of a binding of the aforementioned type is described in patent publication WO 00/13755, and in U.S. Patent No. 6,499,761, to which reference will be

made as necessary for an overall understanding of the functioning of such a binding. Additionally for this purpose, the disclosure of U.S. Patent No. 6,499,761 is hereby incorporated by reference thereto in its entirety. Another example of a binding of the aforementioned type, designed more specifically for alpine ski touring and telemark skiing, is described in European patent publication EP-A1-890 379.

**[0006]** A principle of these devices is to provide for a binding of the boot onto the ski, which is perfectly rigid in torsion, but which allows the heel of the boot to be free to be raised. The device described in the document WO 00/13755 and in U.S. Patent No. 6,499,761 is an improvement to the binding systems currently used, for example, in cross-country skiing or ski touring, in which the boot is journalled by its front end about an axis that is transverse with respect to the ski. Indeed, in the improvement the movement of the foot with respect to the ski, during the lifting of the heel, is a movement that is no longer a mere rotation but which is as close as possible to a natural rolling movement of the foot.

**[0007]** The invention can also be implemented within the scope of a binding device of the type such as those described in the document WO 96/37269 and in U.S. Patent No. 6,113,111 to which reference will be made as necessary for an overall understanding of the functioning of such a binding. Additionally for this purpose, the disclosure of U.S. Patent No. 6,113,111 is hereby incorporated by reference thereto in its entirety.

**[0008]** In this type of binding device, the boot is no longer fastened to the sports article by one or several stationary points, but it is fastened (and affixed) to a linkage/connecting member that can be displaced with respect to the sports article. This displacement can be a mere rotation; however, in the previously cited examples, it is rather a complex displacement that combines rotational as well as translational movements.

**[0009]** These types of bindings can have elastic return arrangements that return the linkage member to a low position corresponding, for example, to the position it occupies when the boot to which it is connected takes support at its front and rear on the sports article. Such elastic return arrangements are very useful, for example, when the binding device is adapted to cross-country skiing, telemark skiing or ski touring, or even for ice skating or roller skating.

**[0010]** Documents WO 00/13755, WO 96/37269, U.S. Patent No.6,499,761, and U.S. Patent No. 6,113,111 do not describe in specificity the manner by which the boot is adapted to be fastened to the linkage member.

### **SUMMARY OF THE INVENTION**

**[0011]** An object of the invention is to provide for the fastening and unfastening of a boot with respect to a linkage member, or connecting member, of a binding device that encompasses those of the aforementioned types. If one wants the boot to be detachable from the sports article, the fastening and unfastening maneuvers must be as simple as possible for the user. The fastening mechanism must therefore be simple, reliable, lightweight and, in particular, it must have a minimum number of elements to remain compact and inexpensive to produce.

**[0012]** To this end, the invention proposes a device for binding a boot to a sports article, the device being a type that has a member for linking to the boot, such member being capable of being displaced with respect to the sports article between a low position and a high position, wherein, for fastening the boot, the linkage member has a front retaining system that cooperates with a front anchor of the boot, and a rear retaining system that cooperates with a rear anchor, whereby the front retaining system can be opened to allow the unfastening of the boot from the binding device.

**[0013]** The invention encompasses particular embodiments in which the boot has a flexible sole. The invention also encompasses embodiments in which the rear anchor of the boot is positioned in the area of, or in front of, the metatarso-phalangeal bending zone of the boot sole.

**[0014]** Still further according to the invention, the connection for effecting the displacement of the connecting/linking member between high and low positions can be of the type that effects pivotal movement about an axis that is stationary relative to the sports article. The connection according to the invention can include one or more connecting rods for connecting the connecting/linking member to the sports article. Further, the invention encompasses a connection whereby the connecting/linking member effects a rolling movement relative to the sports article.

#### **BRIEF DESCRIPTION OF DRAWINGS**

**[0015]** Other characteristics and advantages of the invention will appear from an understanding of the following detailed description with reference to the attached drawings, in which:

FIG. 1 is a schematic cross-sectional view along a longitudinal and vertical plane, of a binding device according to the teachings of the invention before fastening the boot;

FIG. 2 is a view similar to that of FIG. 1, which shows a boot being fastened to the device;

FIG. 3 is a view similar to that of FIG. 2 in which the boot is fastened to the device;

FIG. 4 is a view similar to that of FIG. 3 in which the boot is being unfastened.

FIG. 5 is a top view of a binding device according to a second embodiment of the invention, as shown in parent U.S. patent application No.10/054,913;

FIG. 6 is a longitudinal cross-sectional view along the line VI-VI of FIG. 5, the device being associated with a sports apparatus and a boot;

FIG. 7 is a detailed cross-sectional view of the automatic front locking member along the line VII-VII of FIG. 5;

FIG. 8 and 9 are schematic cross-sectional views along a longitudinal and vertical plane of a binding device according to U.S. Patent No. 6,499,761 on which the improvement according to the invention can be implemented, the figures showing the linkage element of the binding respectively in its low position and in its high position, but the improvement according to the invention not being shown; and

FIG. 10 and 11 are schematic cross-sectional views along a longitudinal and vertical plane of a binding device according to U.S. Patent No. 6,113,111 on which the improvement according to the invention can be implemented, the figures showing the linkage element of the binding respectively in its low position and in its high position, but the improvement according to the invention not being shown.

### DETAILED DESCRIPTION OF THE INVENTION

**[0016]** The binding device 10 shown schematically in FIGS. 1-4 has a base 12 that is adapted to be fixed to a sports article (such as a ski, skate, or snowshoe), but which could also be directly integrated therewith. The binding device 10 also has a linkage member 14 (also referred to as a connecting member or a linking member) on which a boot 11 is adapted to be fastened and unfastened.

**[0017]** This fastening, which is encompassed by the invention, is preferably a "step-in" type system in which the fastening of the boot on the linkage member 14 occurs automatically, by simple contact between the two. The unfastening requires a manual action by the user.

**[0018]** Examples described below (with reference to FIGS. 8-11) are directed to the manner by which the linkage member 14 can be connected to the base 12, although such connection is not intended to be limiting to the invention. As a matter of fact, the invention can be implemented with various types of mechanisms in which the linkage member 14 is movable with respect to the base 12. In this manner, this linkage member 14 can be connected to the base by a mere articulation, as will be described with reference to FIGS. 5 to 7, or by a more complex mechanism, such as those described in the documents previously cited and which have, for example, at least one connecting rod connecting the linkage member 14 to the base 12. In one of these mechanisms, which is illustrated here in FIG. 8 and FIG. 9 and which is fully described in U.S. Patent No. 6,499,761, the linkage member 130 takes support on the sports article by a convex surface 134, and when the linkage member 130 is displaced between its high and low positions, it effects a rolling movement that slides with respect to the sports article 100. One can also see on these figures that the linkage member 130 is linked to the a base member 111 of the device by a connecting rod 122, and that the linkage member 130 is biased by a rubber band 140 for elastically returning it to its low position. In another of these mechanisms, which is illustrated here in FIG. 10 and in FIG. 11, and which is fully described in U.S. Patent No. 6,113,111, the linkage member 203 is linked to the sports article 214 (here an ice-skate) by a number of connecting rods 216, 217, 218, 219. The linkage member is also equipped with means 215 for elastically returning it to its low position.

**[0019]** In the example shown in FIGS. 1-4, the boot 11 has a flexible sole, allowing the sole to bend/flex, having two anchoring elements 31, 32, or anchors, arranged in the sole so as to be flush with the lower surface thereof or, at least, so as not to extend below the lowermost surface of the sole. Anchoring elements 31, 32 of this type are described in U.S. Patent No. 6,289,610, the disclosure of which is hereby incorporated by reference thereto in its entirety, and in European patent publications EP-A-913 102 and EP-A-913 103, to which reference will be made heretofore, as necessary, for more

details. Thus, here there are two cylindrical anchors, or pins, positioned across a longitudinal groove provided in the lower surface of the sole. The front pin 31 is, for example, located in the area of the front end of the sole, and the rear pin 32 is offset toward the rear by approximately 50 millimeters (mm). Nevertheless, the invention could be implemented with anchoring elements having a different geometry. Preferably, the rear anchoring pin is located behind the front anchoring pin, but it is located in the area of or in front of a metatarso-phalangeal bending zone of the boot, i.e., approximately in the front third of the sole. Consequently, the fastening of the boot on the linkage member 14 maintains the flexibility of the boot sole. However, this arrangement does not come without additional constraints for the design of the fastening system, particularly for the rear retaining system.

**[0020]** The linkage member 14 has, at its front end, a first retaining system that, in this case, includes an automatic front latch 34, and which is provided to receive the front cylindrical pin 31 of the boot.

**[0021]** According to this example, the automatic front latch 34 has a stationary jaw 13 that is affixed to the front end of the linkage member 14, and which defines, at its upper portion, a groove 16 that is upwardly open, and a movable jaw 15 that is articulated about a transverse axis 18 directly on the stationary jaw 13, or on the linkage member 14. The movable jaw 15 is provided with an elastic return mechanism, such as a torsion spring 18' positioned around the axis 18, that pushes the jaw 15 back to the closing position shown in FIG. 1, in which the two jaws 13, 15 define a housing having a cross-section corresponding to that of the front transverse pin 31 of the boot 11. The movable jaw 15 has an inclined ramp 17 that is arranged such that, when the pin 31 exerts a substantially vertical force on the ramp 17, from the top downward, it causes a retraction by rocking the movable jaw 15 about the axis 18 toward an open position in which it allows access to the groove 16. When the pin 31 has penetrated into the groove 16, the mechanism for returning the movable jaw 15 returns the latter to its closing position.



The pin 31 is then confined in the housing defined by the front latch 34. Due to their rotating cylindrical sections, the pin 31 and the front latch 34 then allows a rotation of the boot 11 with respect to the linkage member 14 about the transverse axis of the pin 31. Due to the geometry of the elements, particularly that of the movable jaw 15, the front pin 31, once engaged in the latch, cannot cause the opening of the latch.

**[0022]** The linkage member 14 also has a rear retaining system 23 provided with a hook that is mounted to slide longitudinally on the linkage member 14 between an advanced closing position shown in FIGS. 1 and 2, and a pushed back open position. The hook is returned to the front towards its closing position by a spring 22, for example, a compression spring. The hook of the rear retaining system 23 demarcates a groove 38 that is forwardly open whereas its upper surface has a ramp 40 that is inclined downwardly and forwardly.

**[0023]** At rest, as can be seen in FIG. 1, the spring 22 pushes the hook of the rear retaining system 23 to take support toward the front against an abutment surface 25 of the linkage member 14. This abutment surface 25 is positioned such that, when the front pin 31 of the boot 11 is latched in the front latch 34, the rear pin 32 is exactly perpendicular to the inclined ramp 40 of the rear retaining system 23 (see FIG. 2). Consequently, when the rear pin 32 is lowered vertically downwardly, by pivoting about the front pin 31, the rear pin 32 takes support against the inclined surface 40 and causes the backward movement of the rear hook of the rear retaining system 23 with respect to the linkage member 14 by compressing the spring 22 until the hook is completely withdrawn. The rear pin 32 is then facing the groove 38 and the hook of the rear retaining system 23 can once again advance under the action of the return spring 22 until the rear pin 32 is housed in the groove 38. The rear pin 32 can then no longer move upwardly with respect to the linkage member 14.

**[0024]** Preferably, the rear pin 32 is then blocked longitudinally toward the rear not only by the back of the groove 38 of the hook of the retaining system 23, but also by a blocking surface (not shown) provided on the linkage member 14. In this manner, the longitudinal blocking toward the rear occurs by a mechanical abutment, independent of the force of the spring 22. In this position, with the two pins 31, 32 being blocked, the boot 11 is completely fastened to the linkage member 14, as can be seen in FIG. 3.

**[0025]** According to the teachings of the invention, the unfastening of the boot occurs along a movement that, in contrast to the norm, is not a mere reverse movement of the movement for putting on the boot.

**[0026]** As a matter of fact, one can see that the movable jaw 15 of the front latch is capable of being tilted towards its opening position by a mere movement of support on an unlatching member 36 integrated with the movable jaw 15. Advantageously, this unlatching, or actuating, member 36 is arranged outside of the form of the boot, for example, toward the front, which allows it to be very easily accessible. Thus, the unlatching member 36 can be manipulated, for example, by means of a ski pole without the user having to bend down.

**[0027]** Once the front latch 34 is open, the user can lift the front end of his/her boot to disengage the front anchoring pin 31 from the groove 16 (a movement indicated by the arrow A in FIG. 4). Once the front pin 31 is disengaged, the user can very easily disengage the rear pin 32 from the hook of the rear retaining system 23 by merely advancing the boot forwardly (a movement indicated by the arrow B in FIG. 4) without having to manipulate the rear retaining system 23. As a matter of fact, as can be seen in FIG. 4, the rear hook of the rear retaining system 23 takes support against the abutment surface 25 and cannot further advance forwardly. The rear retaining system that is in use under the boot 11, therefore, has no means for opening.

**[0028]** This system for fastening the boot is particularly simple and uses a limited number of elements. It is very compact while being very easy to use when putting the boot on as well as when taking the boot off.

**[0029]** One skilled in the art can break down the invention by creating, only using his/her own general knowledge, alternative embodiments that easily result from the system described hereinabove.

**[0030]** In this manner, one can provide for the front latch to have a movable jaw that is slidable rather than pivotal and/or for the rear hook to be pivotal rather than slidable. Likewise, one can provide for the front latch to be a manual latch that has no elastic return mechanism, instead of being automatic as described.

**[0031]** The elastic return mechanism (such as the spring 22) can possibly be designed to act both on the front latch as well as on the front retaining system. Similarly, the elastic return mechanism of the front and/or rear retaining systems can be constituted by means for returning the linkage member to its low position.

**[0032]** According to the second embodiment of the invention shown in FIGS. 5 to 7, the binding device, is adapted to be inserted between a boot 11 and a sports apparatus 3, which is for example the deck of a snowshoe. As shown in these figures, this binding occurs by means of a front transverse anchor 4, shown as a pin or rod, located in the area of the sole 5 of the boot 11.

**[0033]** The front transverse anchor 4 is adapted to cooperate with corresponding retaining mechanism 6A affixed to a front zone of a linkage element or support plate 7A of the apparatus 3. The support plate 7A is connected to the deck 3 by a transverse axis 80A, so that the support plate 7A is movable with respect to the sports apparatus between a low position (shown at FIG. 6) and a high position (not shown) by a pivotal movement

around the stationary transverse axle 80A. Furthermore, the binding is also carried out by a rear retaining system 8A for retaining a rear anchor part 24A of the heel zone of the boot 11.

**[0034]** The retaining mechanism 8A is affixed to a slide 10A mounted freely in a rectilinear guide 11A of the plate 7A so that it can be adjusted into a position relative to the front of the boot 11.

**[0035]** The front retaining system 6A and the rear retaining system 8A are constituted by positive locking members 12A, 40A with automatic snap engagement, which can be actuated without manual intervention by mere pressure of the boot 11 on the front, then on the rear, along substantially vertical downward movements F1, F2, and consequently in a substantially horizontal position of the boot 11.

**[0036]** The front retaining system 12A for automatic locking of the boot 2, comprises a fixed jaw 13A affixed to the front end of the plate 7A and defines, at its upper portion, a first groove portion 14a open upwardly, and by a movable jaw or rocker 15A journaled 16A at the end of the plate 7A in the vicinity of the fixed jaw 13A and defining, at an upper inner portion, a second groove portion 17A open downwardly and complementary to the first 14A so as to define a cross-section corresponding to that of the front anchor 4 adapted to be housed therein after pushing back the movable jaw 15A against an elastic return member 20A that is specific thereto.

**[0037]** Advantageously, the fixed jaw is made as a single piece with the plate 3, i.e., the fixed jaw and plate are made unitary, during a common molding operation of a plastic material.

**[0038]** The groove portion 14A of the fixed jaw 13A and the complementary groove portion 17A of the movable jaw 15A have outer engagement ramps 18A and 19A defining

therebetween a V in which the transverse rod/pin 4 is positioned prior to its snap engagement.

**[0039]** Furthermore, the rocker 15A has a nose 15a directed forwardly in a direction opposite that of the energy lug 20A in relation to the journal axle 16A, so as to enable its rocking about this axis thereof during an unlocking maneuver.

**[0040]** According to this same second example, the rear retaining system 8A for automatic locking of the boot 11 is constituted by a rigid front spoiler 23A oriented downwardly and forwardly, projectingly raised on the plate 7A and movably affixed to the slide 10 adapted to slide freely in the rectilinear guide 11A of the plate 7A along a rear direction F3 until snap engagement of the front spoiler 23A on an edge 24A of the heel zone of the boot 11 forming a rear anchor, occurring under the action, along a front direction F4, of an elastic return member 25A which is specific thereto and distinct from the elastic return member 20A of the front locking member 12A.

**[0041]** According to this same embodiment, the slide 10A includes an inner part or strip 26A with a width corresponding substantially to a lower inner groove 27A of the plate 7A forming the rectilinear guide 11, on the one hand, and of an outer part or back 28A perpendicularly extending the front spoiler 23A forwardly and taking support on the upper plane 29A of the plate 7A, the strip 26A and back 28A constituting the slide 10A being joined together by an assembly mechanism 30A.

**[0042]** According to a particular characteristic of the front spoiler 23A, the latter has on its upper portion a boot insertion slope 31A directed forward and downward.

**[0043]** Furthermore, the front spoiler 23A is affixed to the outer upper part or back 28A of the slide 10A by means of a perpendicular extension 32A of the latter, on which the front spoiler 23A is fixed by an assembly mechanism 33A.

**[0044]** As seen particularly well in FIG. 8, the front spoiler 23A and extension 32A of the back 28A of the slide 10A on which it is fixed form an interface including complementary teeth 34A enabling a height adjustment, so as to render the rear locking member 8A adaptable to any boot height.

**[0045]** The elastic member 25A for returning the slide 10A and the front spoiler 23A, which is affixed thereto, is constituted by a rubber band, perforated along its entire length with successive adjusting holes 35A, one end hole of which cooperates with a pin 36A obtained beneath the lower surface of the back 28A of the slide 10A, and one of the other holes of which, selected as a function of the length of the boot 2 and of the desired return force F4, cooperates with a fixed pin 37A made on the upper surface 29A of the plate 7A.

**[0046]** Preferably, the pin 36A for fastening the end of the rubber band 25A, positioned beneath the back 28A of the slide 10A, is arranged in longitudinal alignment with another blind and threaded pin 38A, also positioned beneath the lower surface of the back 28A of the slide 10A, the latter being adapted to the fixing of the strip 26A of the slide 10A, so that the two pins 36A and 37A can constitute guides of the slide 10A by displacement in a longitudinal slot 39A of the plate 7A through which they extend.

**[0047]** As a matter of fact, one can see that the movable jaw 15A of the front retaining system 6A is capable of being tilted towards its opening position by pushing downwards on an unlatching member 15a integrated with the movable jaw 15A. Advantageously, this unlatching member, or actuating member, 15a is arranged outside of the form of the boot, for example, toward the front, which allows it to be very easily accessible. Thus, the unlatching member 15a can be manipulated, for example, by means of a ski pole without the user having to bend down.

**[0048]** Once the front retaining system is open, the user can lift the front end of his/her boot to disengage the front anchoring pin 4. Once the front pin 4 is disengaged, the user can very easily disengage the rear part of the boot from the hook of the rear retaining system 23A by merely advancing the boot forwardly without having to manipulate the rear retaining system 23A.